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SAINS TANAH – Journal of Soil Science and Agroclimatology, 13 (2) , 2016, 51-59

RESEARCH ARTICLE

MANAGEMENT OF LEGUME AS LAND COVER CROP AND EMPTY BUNCH FOR THE NITROGEN EFFICIENCY IN INCEPTISOLS AT OIL-PALM PLANTATION

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Submitted : 2015-11-16 Accepted : 2017-02-09

ABSTRACT

The research aimed to know the kind of legume cover crop which more suitable to be cultivated especially in area of Natar, South Lampung and to know the efficiency of N supply. It used a single Randomized Complete Block Design (RCBD) consisted of 4 treatments (several kinds of debris), covering: *kacang benguk* (*Mucuna cochinchinensis*), *kacang ruji* (*Pueraria javanica)*, and oil-palm empty bunch compared to one which no debris added (control). Data analyzed by regression, F test (α 5%; or Kruskal-Wallis), DMR test (α 5%; or Mood Median) and correlation test. Result showed that *Pueraria javanica* (*kacang ruji*) was more suitable to be cultivated. Regression showed that management of empty bunch tend to enhance the ratio of NH_4^+/N-mineral as indicator of N supply efficiency, while the management of *Pueraria javanica* tend to decrease the ratio of NH_4^+/N-mineral. The degradation of soil NO_3^- concentration in the treatment of empty bunch was followed by the degradation of soil nitrification potential and the enhancement of heterotrofic bacteria. The enhancement of soil nitrification potential in the *Pueraria javanica* and *Mucuna cochinchinensis* management was followed by the degradation of soil pH.

Keywords: *benguk (Mucuna cochinchinensis), kacang ruji (Pueraria javanica), empty bunch, NH_4^+/N-mineral, NO_3^-, nitrification potential*

Permalink/DOI : http://dx.doi.org/10.15608/stjssa.v13i1.264

INTRODUCTION

Oil palm, *Elaeis* spp., is of immense global importance and is an excellent model system in which to investigate the relationship between biodiversity and ecosystem services at the landscape level. Oil palm now covers over 14.5 million hectares. Indonesia and Malaysia are the largest producers, and oil palm cultivation is rapidly expanding in areas such as Thailand, Nigeria and Colombia. Palm oil is the most widely used vegetable oil in the world and of huge importance as a biofuel feedstock (William et al 2011).

One of quite expanding agriculture efforts in Indonesia at the time is oil-palm plantation (*Elaeis guineensis* Jacq.). Result of its processing is Crude Palm Oil (CPO) which can be used as raw material in the industry of cooking oil, soap and margarine. On that account, oil palm plantation is still become one of the agriculture sectors that important to be hold up and developed in Indonesia, related to its benefit to the daily life of Indonesian or world. But, problems are frequently come up on its plantation, such as fertilizing expense which is so high and the crop is not too efficient in exploiting the nutrient.

Kind of fertilizer which often be used in its plantation is N fertilizer, even though it is

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the lowest one in exploiting by the crop compared to the other nutrient. Although oil-palm can uptake N in the form of ammonium (NH_4^+) and nitrate (NO_3^-) but the NH_4^+ will be more efficient as a raw material in the NH_3^+ transformation process (reduction), because of the lower need of energy which is 5 ATP per molecule NH_4^+, while NO_3^- needs 20 ATP per molecule. Energy efficiency inside of its tissue caused by NH_4^+ uptake can be used to support the growth and enhance the crop production. Oxidizing of NH_4^+ to NO_3^-, commonly named as nitrification processes, is a harming process because of the N *easy-lose* when transformed in to N-based-gas (N_2O, NO_2, NO and N_2) and really lose caused by eluviations in the form of nitrate (NO_3^-) itself. NO_3^- eluviations will be followed by the eluviations of soil base cation (K+, Ca+ and Mg+) and will decrease the base saturation, enhance soil acidity and finally making worse the soil chemistry properties (Raun and Johnson, 1999).

This study is required to determine the effect of legume cover crop management surly (Mucuna cochinchinensis) and pea trellis (Pueraria javanica) as a cover crop and empty fruit bunches as a result of processing of waste oil palm on soil nitrogen efficiency. Ground cover plants commonly used in oil palm plantations is a type of legume cover crops (Legume cover crops, LCC). The aim is to improve the properties - physical, chemical and biological soil, prevent erosion, maintain soil moisture and suppress plant pests (weeds). Type - the type of legume cover crops commonly grown ground cover in palm oil plantations is Calopogonium caeruleum, Calopogonium mucunoides, Pueraria javanica, Pueraria phaseoloides, Centrocema pubescens, Psophocarphus palustries, and Mucuna cochinchinensis (Rizal, 2010). Cheaply available becomes one of the amenities in using empty bunch, especially when it is applied near its processing factory, also all results from recycling process of its processing factory waste will very beneficial as nutrient source for the oil-palm without any potential toxic (Pahan, 2007).

MATERIAL AND METHODS

Reseach was conducted on November, 2009 up to October, 2010. Located on Mujimulyo RT 23/12, Muara Putih Village, Natar District, South Lampung Regency at 05°15'56,5" S and 105°14"09,6" T. Soil chemical analysis conducted at Soil Chemistry and Fertility Laboratory of Agriculture Faculty, Sebelas Maret University, Surakarta.

It was an experimental research and use a single Randomized Complete Block Design (RCBD) consists of 4 treatments there are Mucuna cochinchinensis, Pueraria javanica, and empty fruit bunches compared with no provision of litter (as control). For the quantities of seed crop legumes (Mucuna cochinchinensis and Pueraria javanica) respectively 0125 kg / plot (1 plots = 243 m2), equivalent to 5 kg / ha for oil palm empty bunches of 50 kg / rorak equivalent to 12.8 tonnes / Ha. The study consisted of 4 treatments, each treatment was repeated four times in order to get 16 treatment combination. Initial soil sampling is done by using a drill ground at a depth of 30 cm from the ground. Sampling was conducted to determine initial soil organic C, total N, C / N and pH H_2O. Soil tillage is done before planting legume crops and immersion oil palm empty fruit bunches. Before planting the seeds need special treatment to increase the yield and accelerate perkecembahan. The treatment by soaking the seeds in hot water temperature 75^0C for 2 hours.

The application of litter pruned executed at the age of 24 weeks after planting. Litter and

empty fruit bunches pruned applied in a manner embedded in rorak. Rorak made with a length of 150 cm; width 50 cm; a depth of 50 cm. Rorak created on the outskirts of the disk where the principal palm oil palm is made of two rorak, so we get a treatment there are six rorak and for all treatments required 72 rorak. Soil sampling and variable measurement of land on legume crops (*Mucuna cochinchinensis* and *Pueraria javanica*) and oil palm empty fruit bunches performed 5 times is 1 times during immersion and 4 times every 50 days (7 weeks) after immersed. The variables observed nitrification potential, amonium (NH_4^+, nitrat (NO_3) and other secondary variables such a soil pH, organic C, N-total, litter biomass, soil temperature, rainfall, soil humidity, heterotrof bactery. Data analyzed by regression test, F test (α 5%) or Kruskal-Wallis and DMR test (α 5%) or Mood Median, also Correlation test. To know the trend of the effect of treatment using the regression equation. To determine the relationship between variables used correlation analysis. Analysis of data using Minitab 13 and Excel software.

RESULT AND DISCUSSION

Biomass of Legume Plant Litter to Land Cover

Litter biomass yield ages of 24 weeks from the management of legume cover crops *Mucuna cochinchinensis* and *Pueraria javanica* are presented in Table 1.

Based on table 1 can be seen that legume cover crops are more suitable for cultivation in the hamlet Mujimulyo RT 23/12 Village White Muara district. Natar, Kab. South Lampung is a type of *Pueraria javanica* (pea trellis) compared to *Mucuna cochinchinensis* (surly).

Table 1. Plant litter biomass Legume Land Cover

Block	Unit	Treatment	
		Mucuna cochinchinensis	***Pueraria javanica***
1	Kg/ha	329.22	3333.33
2	Kg/ha	308.64	4485.60
3	Kg/ha	370.37	4979.42
4	Kg/ha	534.98	5555.56

Source: Results of Measurement Scales in Palm Oil Plantations Natar South Lampung 2010

Effect of treatment of soil concentrations of NH_4^+

Based on the research results can be seen that the management of legume cover crops and processed palm oil waste affects soil concentrations of NH_4^+ The dynamics concentration of NH_4^+ soil in all treatments are presented in Table 2.

The data in Table 2 shows when the application (week-0), the concentration of NH_4^+ soil highest on the management of *Pueraria javanica* at 8.669 ppm, but the concentration of NH_4^+ soil was not significantly from all the treatment is *Mucuna cochinchinensis* (7160 ppm), empty fruit bunches (7331 ppm), and control (6997 ppm). At week 24 a decrease in the concentration of NH_4^+ except in the management of empty fruit bunches is an increase of 2.252 ppm (30.72%). Decrease of NH_4^+ concentration in the soil of *Mucuna cochinchinensis* 4:06 ppm (56.70%) while in *Pueraria javanica* at 4633 ppm (53.44%).

NH_4^+ concentrations increased in all treatment at week 31. Management of legume cover crop *Pueraria Javanica* produce the highest NH_4^+ 15.100 ppm is equal to the percentage increase of 274.13% (11 064 ppm). In the legume crop management of *Mucuna cochinchinensis* produce NH_4^+ concentration of 5.395 ppm with a percentage increase of 74.03% (2295 ppm). Increased concentrations of NH_4^+ soil on the management of legume cover crops allegedly due to the addition of organic matter into the soil by week 24. Legume cover crops *Mucuna cochinchinensis* and *Pueraria javanica* have a

Table 2. Soil concentrations of NH_4^+

Treatment	Units	Week of-				
		0	24	31	38	45
Mucuna cochinchinensis	ppm	7.160	3.100	5.395	5.237	2.757
Empty fruit bunches	ppm	7.331	9.583	10.706	6.962	4.710
Pueraria javanica	ppm	8.669	4.036	15.100	8.373	2.957
Kontrol	ppm	6.997	3.891	5.181	4.902	3.360

Source: Results of Laboratory Analysis of Soil Science Faculty of Agriculture, UNS 2009-2010

ratio C/N respectively 17 and 15.70. For a ratio of C/N < 20 then quickly release of N into soil organic matter (Leiwakabessy et al., 2003). While the management of empty fruit bunches has increased by 11.72% (10.706 ppm) with NH_4^+ concentration of 10 706 ppm.

At week 38 a decrease in soil NH_4^+ concentrations in all treatments. The highest decrease in the management of legume cover crop Pueraria javanica is equal to 44.565% (6.727 ppm), followed by the management of empty fruit bunches are also decreased by 34.97% (3.744 ppm) and the control and management of plant *Mucuna cochinchinensis* respectively decreased concentration of soil NH_4^+ 5.38% (0.279 ppm) and 2.93% (0.158 ppm). Decrease of NH_4^+ soil concentration also occurred at week 45. The highest decrease in the management of the legume cover crops on *Pueraria javanica* by 64.68% (5.416 ppm), followed by *Mucuna cochinchinensis* of 47.35% (2.48 ppm) as well as the management and control of empty fruit bunches, each of which has decreased the concentration NH_4^+ at 32.35% (2.252 ppm) and 31.45% (1.542 ppm). Decrease of NH_4^+ soil concentration at week 38 and 45 suspected in the absence of addition of organic matter into the soil. Mancinelli 1992 says, ammonium (NH_4^+) soil derived from the hydrolysis of fertilizer N or from the mineralization of organic matter.

From data in Table 2 shows that concentration of NH_4^+ increased due to the addition of organic litter into the soil. The number of entries that the higher the organic litter followed by NH_4^+ concentrations are higher, but high inputs of organic litter is proving able to retain N in the form of NH_4^+. This can be seen from the concentration of NH_4^+ in the empty fruit bunches are better able to retain N in the form of NH_4^+ from week 0 to week 45 compared to the management of *Pueraria javanica*. This indicates magnitude of the concentration of NH_4^+ is influenced by the amount of organic material embedded into the ground, and the ratio C/N is high in organic matter influential in maintaining the N in the form of NH_4^+.

Effect of treatment of soil NO_3^- concentration

Variability of test results showed that at week 24 of treatment effect is high significant to the concentration of NO_3^- in the management of empty fruit bunches (P = 0.000) and *Pueraria javanica* (P = 0.004), whereas at week-31 test results showed that the diversity of treatment effect a high significant on the concentration of NO_3^- in controls (P = 0.006) and a marked influence on the management of *Pueraria javanica* (P = 0.042). NO_3^- soil concentration values are presented in Table 3.

Table 3 shows that the week-0, or when the application is no difference in NO_3^- concentration in each treatment. Highest concentration of NO_3^- on management of legume cover crops *Mucuna cochinchinensis* (37.777 ppm) followed by empty fruit bunches (33.495 ppm), *Pueraria javanica* (30.606), and control of the lowest (28.534 ppm).

Table 3. Soil concentrations of NO_3^-

Treatment	Units	Week of-				
		0	24	31	38	45
Mucuna cochinchinensis	ppm	37.777	9.288	28.137	18.016	15.280
Empty fruit bunches	ppm	33.495	32.691	29.542	23.112	15.268
Pueraria javanica	ppm	30.666	18.083	34.804	29.437	20.468
Kontrol	ppm	28.534	9.987	20.209	13.215	7.948

Source: Results of Laboratory Analysis of Soil Science Faculty of Agriculture, UNS 2009-2010

Table 4. Bacteria Heterotroph

Treatment	Units	Week of-				
		0	24	31	38	45
Mucuna cochinchinensis	cfu/g	$9.18x10^8$	$1.5x10^8$	$1.6x10^7$	$5.2x10^8$	$5.7x10^7$
Empty fruit bunches	cfu/g	$4.2x10^8$	$5.7x10^8$	$1.2x10^7$	$3.5x10^8$	$6x10^7$
Pueraria javanica	cfu/g	$1.4x10^7$	$6.2x10^8$	$7.9x10^5$	$6.2x10^8$	$3.8x10^7$
Kontrol	cfu/g	$9.4x10^8$	$8.2x10^8$	$1.5x10^8$	$1.9x10^8$	$6.3x10^7$

At week 24 a decrease in NO_3^- concentration of land in all treatments. The highest decrease in the management of legume cover crops *Mucuna cochinchinensis* by 306.73% (28.489 ppm) and the lowest decrease in the management of empty fruit bunches of 2.46% (0.804 ppm). In the management of legume cover crop *Pueraria javanica* and control the concentration of NO_3^- decreased at 12 523 ppm (40.92%) and 18 548 ppm (65%). Decrease in NO_3^- concentration of land in bunches followed by bare soil nitrification potential impairment (table 5) for 20,147 $mgN.g^{-1}dm.5h^{-1}$ (46.52%) and followed by an increase in heterotrophic bacteria (Table 4) of 1.5 x 108 cfu / g soil (35.71%). This indicates that increase of organic material that have high ratio of C/N in soil indirectly can to inhibit the nitrification because NH_4^+ the mineralization of organic matter and NH_4^+ in the soil will be immobilized by microbial heterotrophs that decomposer of organic matter so as not to leave the substrate NH_4^+ for nitrification (Purwanto, 2009[b]). Decomposition of organic material will also absorb the O2 in soil so there is competition use O2 between microbia heterotrophic and nitrifying bacteria that will also indirectly inhibit nitrification. Once the organic material decomposes and the ratio C/N is down, then some of the immobilized N will be mineralized to available again of NH_4^+ as a substrate nitrification. Therefore, the ratio C/N of soil organic matter can be a regulator of nitrification and nitrate concentrations in soil (Mancinelli, 1992).

Week-31 there was an increase in the concentration of NO_3^- on management legume cover crop and control, while the management of empty fruit bunches decreased. Increased concentrations of NO_3^- highest in the management of legume cover crops *Mucuna cochinchinensis* by 202.94% (18.849 ppm), followed by *Pueraria javanica* by 92.47% (16 721 ppm). Presumably the increase is because there is the addition of organic matter in week 24 so it is been a process of mineralization, which *Mucuna cochinchinensis* and *Pueraria javanica* have a ratio C/N as low as 15.70% and 17%. Winarso (2005) said the conditions of organic matter (C/N) was added to the soil affects the processes of mineralization and immobilization, organic materials that have a

C/N is low (<20) in a few weeks is going to release the elements it contains, particularly NO_3^- or mineralization occurred.

Decrease in NO_3^- concentration in all treatments occurred at weeks 38 and 45. This is presumably due to reduction in soil concentrations of NH4 +. According Rosmarkam and Yuwono (2002), NH_4^+ released by microorganism or a microbiological fertilizers are often converted to NO_3^- called nitrification. This illustrates that the initial substrate of nitrification is NH_4^+, NH_4^+ decreased soil that would lower the concentration of soil NO_3^-.

Effect of treatment of soil nitrification potential

The study shows that the dynamics of change in potential nitrification occurred in the treatment of legume cover crop management and yield of processed palm oil waste. Soil nitrification potential values are presented in Table 5.

In Table 5 shows that when the application (week-0) nitrification potential was highest in the control of 92.725 mgN.g^{-1}dm.5h^{-1} and the lowest nitrification potential in the management of empty fruit bunches at 43.310 mgN.g-^{1}dm.5h-^{1}. Soil nitrification potential value in the management of legume cover crops *Mucuna cochinchinensis* and *Pueraria javanica*, each for 68 063 mgN.g^{-1}dm.5h^{-1} and 55 076 mgN.g^{-1}dm.5h^{-1}. But at week 24 decreased nitrification potential in all treatments. Highest decline of 75.46% in controls (69.97 mgN.g^{-1}dm.5h^{-1}) followed by the management of legume cover crop *Pueraria javanica* by 75.56% (51.432 mgN.g^{-1}dm.5h^{-1}) and *Mucuna cochinchinensis* by 71.12% (39.168 mgN.g^{-1}dm.5h^{-1}), whereas the management of empty fruit bunches of the lowest decrease in the amount of 46.52% (20.147 mgN.g^{-1}dm.5h^{-1}).

Soil nitrification potential value decreased in the management of empty fruit bunches suspected of immobilization process, because at week-0 (time of application) empty fruit bunches have been buried into the ground, compared with the management of legume cover crops that immersion litters at week 24. It shows the C/N empty fruit bunches are high then the process of decomposition by microorganisms and mineralization in the field running relatively slow (Pahan, 2007) so that the nitrification potential is hampered due to N mineralization results are absorbed by the roots of plants for their needs and immobilized into organic N or biomass of decomposer bacteria. Also seen an increase in heterotrophic bacteria (Table 4) at week 24 of 1.5 x 108 cfu / g soil (35.71%), thus indicating immobilization process is greater than the nitrification process. Nitrification potential drop on the control and management of legume cover crops in week-24 presumably because there is no substrate nitrification is NH_4^+. This can be seen from the decrease in the concentration of NH_4^+ (Table 1)

Table 5. Soil Nitrification Potential

Treatment	Units	Week of-				
		0	24	31	38	45
Mucuna cochinchinensis	mgN.g^{-1}dm.5h^{-1}	55.076	15.908	19.485	4.824	5.671
Empty fruit bunches	mgN.g^{-1}dm.5h^{-1}	43.310	23.163	8.110	9.005	20.240
Pueraria javanica	mgN.g^{-1}dm.5h^{-1}	68.063	16.621	24.932	10.642	6.193
Kontrol	mgN.g^{-1}dm.5h^{-1}	92.275	22.755	10.449	5.146	6.643

Source: Results of Laboratory Analysis of Soil Science Faculty of Agriculture, UNS 2009-2010

Table 6. Soil pH

Treatment	Week of-				
	0	24	31	38	45
Mucuna cochinchinensis	5.36	5.62	5.25	5.90	5.75
Empty fruit bunches	5.80	5.6	5.79	6.03	6.13
Pueraria javanica	5.52	5.79	5.50	5.87	5.92
Kontrol	5.73	5.35	5.42	5.36	5.43

Source: Results of Laboratory Analysis of Soil Science Faculty of Agriculture, UNS 2009-2010

in the management of legume cover crops *Mucuna cochinchinensis* and *Pueraria javanica* as well as control of 4.06 ppm (56.70%), 4.633 ppm (53.44%) and 3.107 ppm (44.40%).

At week-31 an increase in value of the nitrification potential in the management of *Pueraria javanica* by 50% (8.311 mgN.g^{-1}dm.5h^{-1}) and *Mucuna cochinchinensis* by 22.48% (3.577 mgN.g^{-1}dm.5h^{-1}) . The increase was followed by a decrease in soil pH (Table 4.6) at 0.29 (5%) and 0.37 (6:58%). Decrease in pH value is due to increase a nitrification potential in soil, in which the nitrification process will release H^+ ions so that the soil will become more acidic (Winarso, 2005). Nitrification potential increase in soil is suspected because there has been the addition of organic matter in week 24 so it's been a process of mineralization.

From Table 5 shows that at week 38 a decrease in nitrification potential soil in all treatments except the treatment of empty fruit bunches is an increase of 1% (0.895 mgN.g^{-1}dm.5h^{-1}). Nitrification potential increase in soil also occurs on empty bunches at week-45 that is equal to 124.82% (11.241 mgN.g^{-1}dm.5h^{-1}). In the management of legume cover crop *Pueraria javanica* decreased soil nitrification potential value at week 38 and 45 at 14.29 mgN.g-^{1}dm.5h-^{1} (17.21%) and 4.449 mgN.g^{-1}dm.5h^{-1} (41.81%). Decreased nitrification potential is suspected due to the absence of additional organic matter into the soil. Purwanto 2009[a] suggested that if the mineralization is inhibited in the absence of fertilization or NH_4^+, so nitrification will not last.

Effect of treatment of the ratio of NH_4^+/N-mineral soil

Based on the variability of test results showed that the treatment effect is high significant to the ratio of NH4$^+$/N-mineral soil at week-31 (P = 0.001) and significant at week-0 (P = 0.016) and 45 (P = 0.018). Ratio of NH_4^+/N-mineral soil are presented in Table 7.

Based on Table 7 shows that week-0 (time of application) ratio of NH_4^+/N-Mineral soil was highest in the management of cover crops legume *Pueraria javanica* at 21 807% followed by the control 20 014% and empty fruit bunches of 17 968% and the ratio of NH_4^+/N-mineral soil lowest in the management of legume cover crops *Mucuna cochinchinensis* by 15 937%.

The addition of empty fruit bunches litter at week -0 (time of application) showed an increase in the ratio of NH_4^+/N-mineral soil at week 24 by 5526% with an increasing percentage of 29.52%. Increased ratio of NH_4^+/N-mineral also occurs in week 31 of 3.347% with the percentage increase of 14.41%. Increased ratio of NH_4^+/N-mineral soil indicates low nitrification actually in the ground, because ratio concentration of NH_4^+/N-mineral soil describe the magnitude of nitrification actual in the soil, the lower the ratio of NH_4^+/N-mineral soil will lower the

Table 7. Ratio of NH_4^+/N-mineral soil

Treatment	Units	Week of-				
		0	24	31	38	45
Mucuna cochinchinensis	%	15.937	25.109	16.694	22.996	15.948
Empty fruit bunches	%	17.968	23.224	26.571	23.814	23.901
Pueraria javanica	%	21.807	18.017	30.041	22.732	14.353
Kontrol	%	20.014	28.047	20.751	39.519	31.705

Source: Results of Laboratory Analysis of Soil Science Faculty of Agriculture, UNS 2009-2010

proportion between the amonifikasi compared with nitrification the ground or lower efficiency utilization of N from soil (Purwanto, 2009[b]). This is supported by a decline in the value of the soil nitrification potential (Table 5) at week 24 and 31 with 46.52% and the percentage drop 64.99%.

Increased ratio of NH_4^+/N-mineral week-24 also occurred in the management of *Mucuna cochinchinensis* and control by 9.172% (57.55%) and 8.033% (40.14%), whereas the management of *Pueraria javanica* decreased ratio of NH_4^+/N-mineral soil at 3.79 % (17.38%). At week 31 a decrease in the ratio of NH_4^+/N-mineral soil on *Mucuna cochinchinensis* and control by 7.092% (28.24%) and 7.296% (26.1%) and improvement in the management of *Pueraria javanica* at 12 024% (66.87%).

At week-38 ratio of NH_4^+/N-mineral soil was highest in control at 39 519% followed by management of empty fruit bunches at 23 814% and management of legume cover crops *Mucuna cochinchinensis* and *Pueraria javanica* at 22.996% and 22.732%. The decline occurred at week 45 in management of legume cover crops *Mucuna cochinchinensis* and *Pueraria javanica* at 7.048% (30.65%) and 8.379% (36.86%) and in control at 7.814% (19.77%), whereas an increase in management of empty fruit bunches at 0.087% (0.36%).

Regression test results show management of empty fruit bunches tend to increase ratio of NH_4^+/N-mineral soil compared to *Pueraria javanica* which tends to lower the ratio of NH_4^+/N-mineral soil. Purwanto (2007) says, ratio of NH_4^+/N-mineral describe magnitude efficiency of N in the soil. If the higher ratio of NH_4^+/N-mineral soil indicates the lower nitrification actual in the soil, the lower potential for leaching of NO_3^- and a higher efficiency of N, whereas if the lower the ratio of NH_4^+/N-minerals will lower the process amonifikasi than nitrification is occur in the soil. This proves that management of empty fruit bunches on palm oil plantations more efficient utilization of N in the soil than the management of legume cover crop *Pueraria javanica*.

CONCLUSION

1. Legume cover crops suitable cultivated on palm oil in Natar South Lampung is *Pueraria javanica* (pea trellis).
2. Decrease in NO_3^- concentration of land in empty fruit bunches followed by nitrification potential soil impairment and an increase in heterotrophic bacteria.
3. Nitrification potential improvement in the management of cover crops followed by a decrease in soil pH.
4. Management of empty fruit bunches tend to increase ratio of NH_4^+/N-mineral soil while *Pueraria javanica* management tends to lower the ratio NH_4^+/N-mineral soil.

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